Dry Well & Infiltrating Catch Basin


Source: Eastern CT Conservation District, nianticriverwatershed.org

Stormwater BMP Type

Pretreatment BMP	□
Infiltration BMP	■
Filtering BMP	□
Stormwater Pond BMP	□
Stormwater Wetland BMP	□
Water Quality Conveyance BMP	□
Stormwater Reuse BMP	□
Proprietary BMP	□
Other BMPs and Accessories	□

Stormwater Management Suitability

Retention	■
Treatment	■
Pretreatment	□
Peak Runoff Attenuation	□

Pollutant Removal

Sediment*	**High**
Phosphorus	**High**
Nitrogen	**Low**
Bacteria	**High**

*Includes sediment-bound pollutants and floatables (with pretreatment)

Implementation

Capital Cost	**Medium**
Maintenance Burden	**Medium**
Land Requirement	**Low**

Description

Dry wells and infiltrating catch basins are open-bottom subsurface storage structures and/or stone reservoirs designed to infiltrate stormwater in a small footprint. While the general design is consistent between the two applications, a dry well is used to manage clean, roof runoff and thereby does not require pretreatment. An infiltrating catch basin is used to manage stormwater from other sources such as roads and parking lots and thereby requires pretreatment.

Dry wells and infiltrating catch basins can both be designed as perforated precast concrete structures surrounded by crushed stone. The perforated structure that makes up the system temporarily stores stormwater before it infiltrates into the surrounding soils. Dry wells can also consist of an excavated stone-filled pit. Filter fabric is used along the sidewalls of both dry wells and infiltrating catch basins. Both types of systems should be designed as off-line practices for retention/runoff reduction, treatment, and groundwater recharge of stormwater runoff from the water quality storm.

These systems are typically more costly than other infiltration BMPs that are located at the surface. Infiltrating catch basins require a separate pretreatment structure such as a proprietary BMP or separate deep sump hooded catch basins. Their advantage is that they are buried, and their footprint is small compared to infiltration chambers. As a result, these practices are ideal when space is limited and only small, discrete controls can fit into a site.

and Figure 13-12 are schematics of two typical dry well designs, one using a stone-filled pit and the other a perforated precast concrete structure. Figure 13-13 and Figure 13-14 show schematics of two different infiltrating catch basin designs, including a perforated precast concrete structure and a vertical corrugated perforated pipe.

Advantages

- Allows stormwater to be recharged on sites where there is little space available at the ground surface and below grade because of utility conflicts. Can be located under pavement. As a result, useful in stormwater retrofit applications where space is limited and where additional runoff control is required.
- Suitable in both urban and rural settings.
- Suitable for piped drainage systems.
- Can be used to enhance storage and recharge capability of other BMPs.
- High solids, phosphorus, and bacteria removal efficiency.
- Can provide stormwater retention, runoff volume reduction, and groundwater recharge.

Limitations

- Infiltration surfaces are buried, often under paved surfaces. Failed systems require excavating and replacing the system as well as repairing at-grade improvements built over the system. As a result, pretreatment is more critical for underground systems.
- Routine maintenance can be overlooked because the practice is not readily visible.
- Buried utilities can be a substantial conflict to constructing these systems, but less potential conflict compared to infiltration chambers.
- Typically requires a piped drainage system to divert runoff into the structure.
- Lower removal of dissolved pollutants especially in coarse soils.
- Should not be used with underdrain systems.
- Cannot provide significant stormwater quantity control unless used in areas with very high infiltration rates, or if a dry well is used in conjunction with a cistern and rainwater harvesting system.

Siting Considerations

- **Potential Locations:** Best located where there is inadequate surface area for more cost-effective approaches to infiltrate stormwater. Suitable under parking lots, roads, sidewalks and other at-grade, built features. Dry wells can also be placed under lawn areas to

infiltrate roof runoff. Surfaces above the system may need to be excavated in the future in the case of a failed system, and thereby need to be replaceable. As a result, these systems should not be used under structures. Suitable in urban and rural settings.[84]

- **Siting In / Adjacent to Roadways:** The top elevation of the perforated chamber is recommended to be kept at least 2' below the bottom of the roadway base material.[84]
- **Drainage Area:** The maximum contributing drainage area should not exceed 1 acre; however, a series of connected dry wells or infiltrating catch basins can be used to manage a larger area to a maximum of 5 acres.
- **Maintenance Considerations:** Ensure adequate vehicle maintenance access to pretreatment elements for infiltrating catch basins. Any at-grade improvements constructed above the systems should be replaceable in case of the need to replace the system if it fails.
- **General:** Meet the soils, water table, bedrock, and horizontal setback requirements specified in Chapter 10 - General Design Guidance for Stormwater Infiltration Systems (General Design Guidance for Stormwater Infiltration Systems). Should be designed as off-line practices.

Soil Evaluation

- Conduct an evaluation of the soil characteristics and subsurface conditions at the location of the proposed system including soil type, depth to the seasonal high groundwater table, depth to bedrock, and soil infiltration rate. Refer to Chapter 10 for soil evaluation guidance.

Design Recommendations

Pretreatment

- Pretreatment is not required for dry wells that only receive clean roof runoff.
- For infiltrating catch basins that manage runoff from other sources, incorporate pretreatment measures at locations where runoff enters the system in accordance with the Pretreatment BMPs section of this Manual.
- Acceptable pretreatment measures are those that are suitable for piped drainage systems and include deep sump hooded catch basins and proprietary pretreatment devices.

[84] Note: Infiltration systems below CT DOT roads are not permitted. Infiltration systems adjacent to CTDOT roads shall be directed exfiltration away from pavements base, subbase and subgrade. An impermeable barrier may be required.

- Pretreatment measure(s) should have a minimum storage volume of 25% of the Water Quality Volume (WQV) or treat at least the equivalent Water Quality Flow (WQF) if using a proprietary treatment device.

Sizing and Dimensions

- Size the precast concrete structure and crushed stone reservoir to hold and infiltrate the design volume below the elevation of any outlet and fully dewater within 48 hours after the end of a storm event.
- Multiple connected structures can be used to achieve the required design volume.
- These systems should be designed by either the Static or Dynamic Methods as described in Chapter 10 - General Design Guidance for Stormwater Infiltration Systems.
- Water Surface
  - Water surfaces elevations in the system should be designed to avoid flooding the subbase of paved surfaces.
- Bottom Slope
  - Bottom slope should be level.
- Surface Cover
  - Dry wells and infiltrating catch basins should be covered by a minimum of 12 inches of soil or subbase material.

Inlet

- Design the inlet in accordance with the Inlet and Outlet Controls section of this Manual.
- Runoff is typically introduced through inlet structures and pipes.
- Design infiltrating catch basins in an off-line configuration to the extent feasible if runoff is delivered by a storm drainpipe or is along the main storm conveyance system.

Outlet & Overflow

- Design the outlet in accordance with the Inlet and Outlet Controls section of this Manual.
- Outlets are typically a pipe that discharges to a storm drainage system. The outlet should be designed in a manner that allows the desired storage volume to be maintained in the system.
- Dry wells that receive runoff from a roof downspout are typically designed to bypass flows in excess of the water quality storm via a surface overflow to a splash pad and vegetated area.

Materials

- Precast Concrete Structures
  - Open-bottom perforated precast concrete vault as available from the manufacturer.

- Crushed Stone
  - Perforated precast concrete dry wells and infiltrating catch basin structures should be underlain and backfilled with clean (washed and free from dirt and debris), crushed, angular stone with a diameter of 1.5 to 3 inches (porosity of 40 percent).
  - A minimum of 6 inches of crushed stone should be placed below the bottom of the precast concrete structure and a minimum of 12 inches of crushed stone surrounding the structure. Additional stone may be used on the bottom and sides of the structure to increase the available storage volume.
  - Dry wells constructed as stone-filled excavated pits should be backfill with clean (washed and free from dirt and debris), crushed, angular stone with a diameter of 1.5 to 3 inches (porosity of 40 percent).

- Observation Well
  - For dry wells constructed as stone-filled excavated pits, an observation well should be installed within the dry well to monitor the water drainage in the system. The well should consist of a well-anchored, vertical perforated 4- to 6-inch diameter PVC pipe with a lockable aboveground cap (Figure 13-14).

- Observation wells are not required in precast concrete dry wells or infiltrating catch basins because water levels in these systems can be visually inspected via a manhole.

- Filter Fabric
  - Wrap around the exterior sides and top of the crushed stone only. Do not provide filter fabric on the bottom of the crushed stone.
  - Use non-woven filter fabric that complies with State of Connecticut Department of Transportation Standard Specifications, Section M.08.01.19 (Drainage – Geotextiles).

Construction Recommendations

- The designing qualified professional should develop a detailed, site-specific construction sequence.

- The designing qualified professional should inspect the installation during the following stages of construction, at a minimum:

  - After excavation and scarification of bottom and sidewalls of excavation

  - After placement and leveling of stone

- After placement of precast concrete structure
- After installation of bypass, outlet/overflow, and inlet controls
- After infiltration system has been backfilled

- The designing qualified professional should provide an as-built plan of the completed infiltration system along with a certification that the system was designed in accordance with the guidance contained in this Manual and other local or state requirements and that the system was installed in accordance with the approved plans and manufacturer's guidelines.
- The entire contributing drainage area should be completely stabilized prior to directing any flow to the system. Adequate vegetative cover must be established over any pervious area adjacent or contributing to the system before runoff can be accepted.
- Erosion and sediment controls should be in place during construction in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control and the Soil Erosion and Sediment Control (SESC) Plan developed for the project.
- During clearing and grading of the site, measures should be taken to avoid soil compaction at the location of the proposed system.
- The system should be fenced off during the construction period to prevent disturbance of the soils.
- The infiltration system should be excavated to the dimensions, side slopes, and elevations shown on the plans. The method of excavation should avoid compaction of the bottom of the system. Excavation equipment should not be allowed within the limits of the system.
- The stone storage media should be placed in the excavation by a hydraulic excavator or backhoe loader located outside the limits of the infiltration system and then hand-raked to the desired elevation.

Maintenance Needs

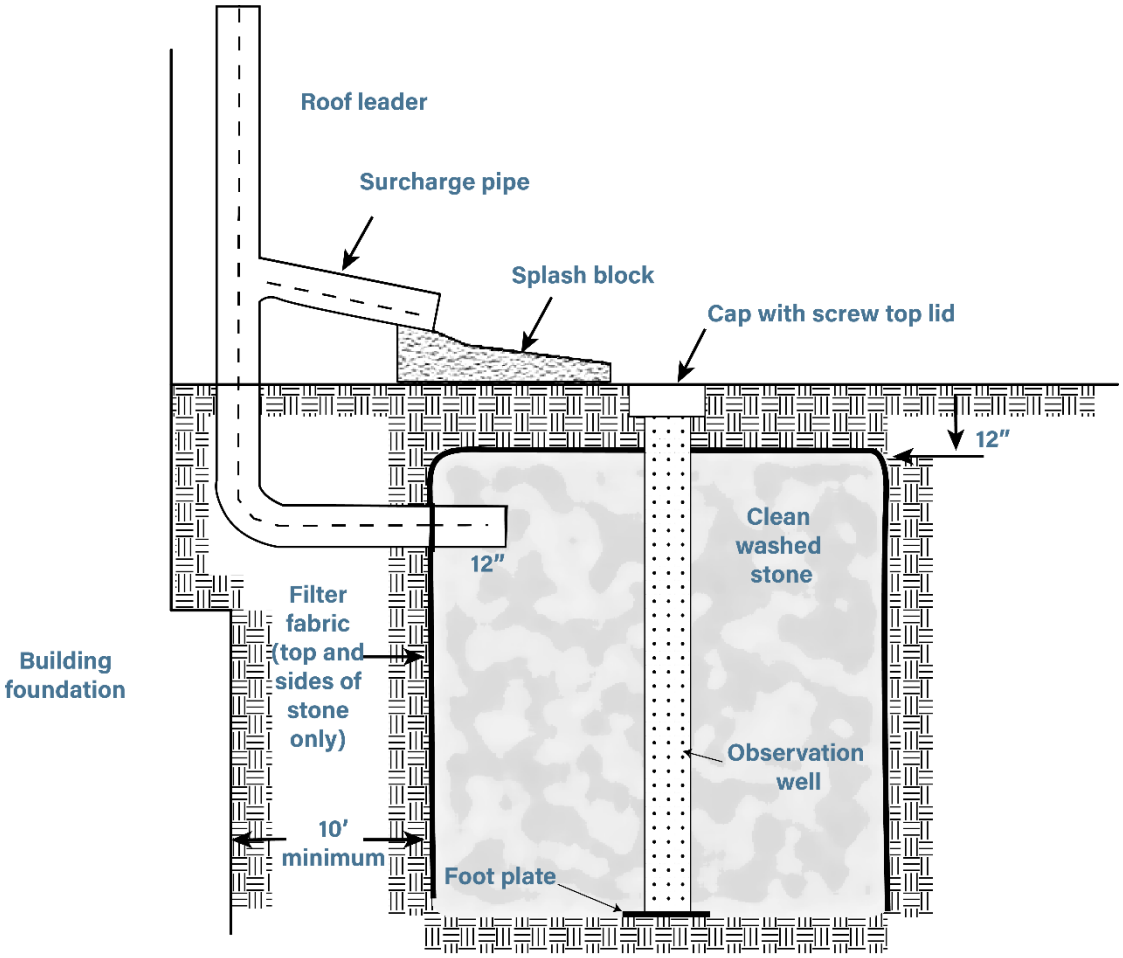
- Dry wells and infiltrating catch basins should be designed with easy access to all components of the system for maintenance purposes. Refer to Chapter 7 - Overview of Structural Stormwater Best Management Practices for general design considerations to reduce and facilitate system maintenance.
- Detailed inspection and maintenance requirements, inspection and maintenance schedules, and those parties responsible for maintenance should be identified on the plans and in the Stormwater Management Plan.
- Maintenance should be detailed in a legally binding maintenance agreement.

- Typical maintenance includes removal of accumulated oil and grease, floatables, and sediment from the precast concrete structure and any pretreatment structures using a vacuum truck.

Recommended Maintenance Activities

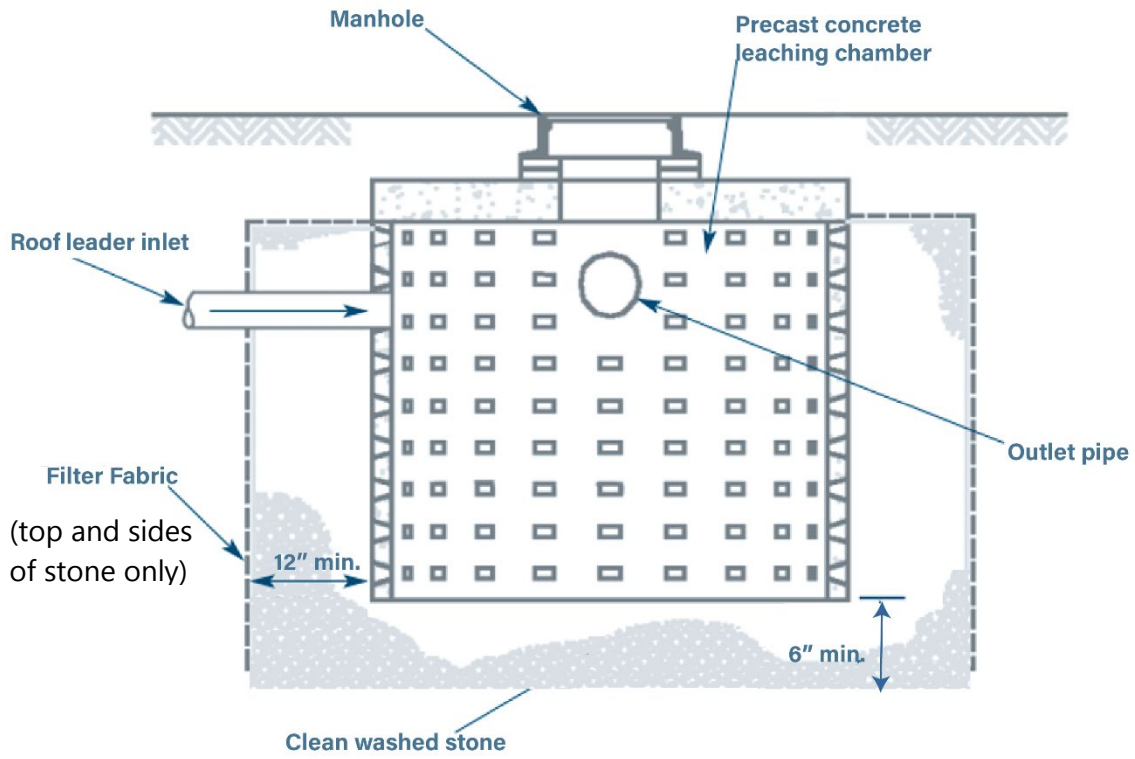
- Inspect after major storms (1 inch or more of precipitation) in the first few months following construction.
- Inspect precast concrete infiltration structure and any pretreatment structures twice a year.
- Refer to Appendix B for maintenance inspection checklists, including items to focus on during inspections.
- Remove sediment from the pretreatment structure when it accumulates to more than 50% of the design depth.
- Remove sediment from the precast concrete infiltration structure when the sediment accumulation exceeds 2 inches throughout the bottom of the structure or when drawdown time exceeds 48 hours after the end of a storm event (for any style dry well or infiltrating catch basin), indicating that the system is clogged.

Figure 13-11. Schematic of Typical Drywell



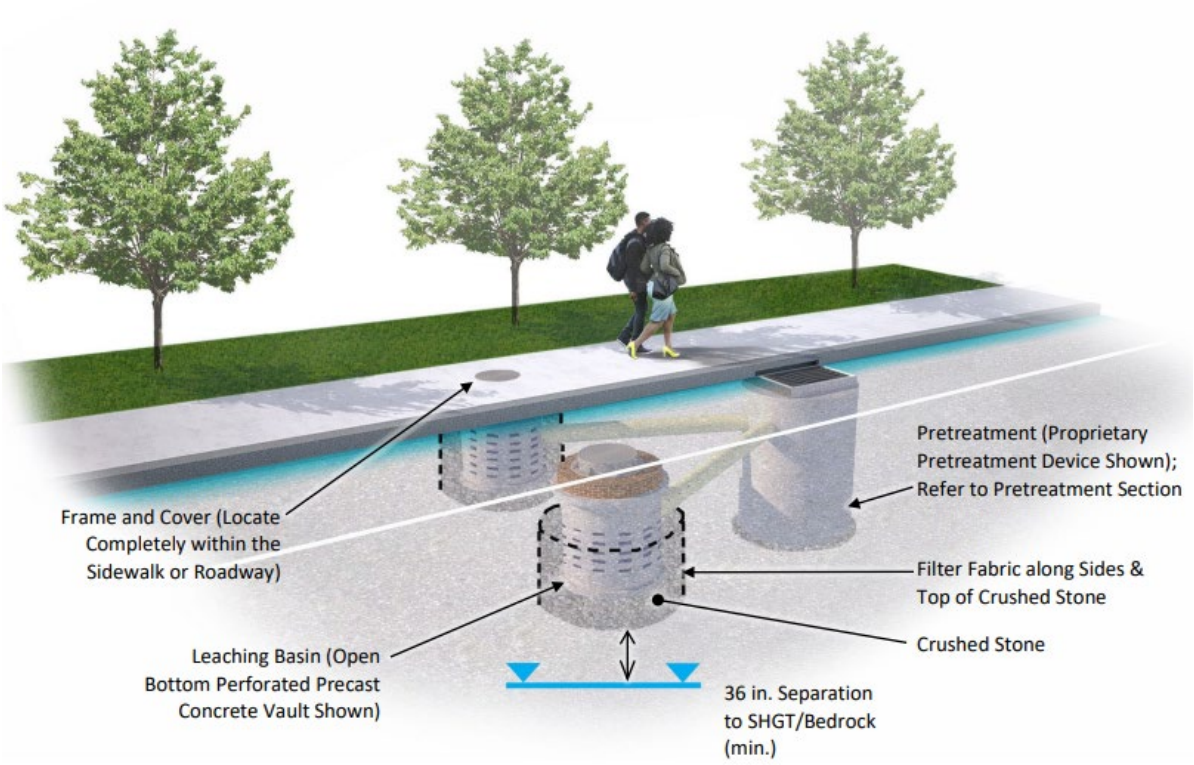
Source: Adapted from Center for Watershed Protection, 2000.

Figure 13-12. Schematic of Typical Perforated Precast Concrete Drywell



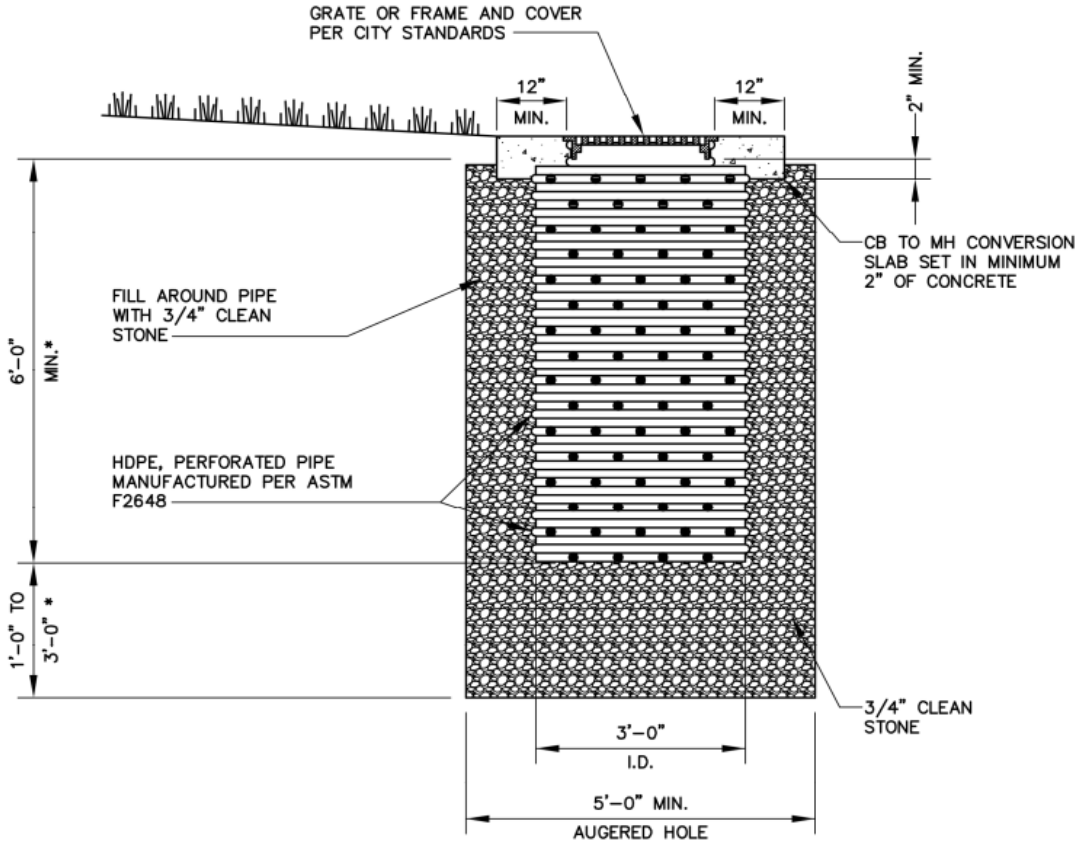
Source: Fuss & O'Neill, Inc.

Figure 13-13. Schematic of Typical Perforated Precast Concrete Infiltrating Catch Basin



Source: RIDOT, 2019.
Note: Infiltration systems below CT DOT roads are not permitted. Infiltration systems adjacent to CTDOT roads shall be directed exfiltration away from pavements base, subbase and subgrade. An impermeable barrier may be required.

Figure 13-14. Schematic of Typical Vertical Corrugated Perforated Pipe Infiltrating Catch Basin



Source: Adapted from City of New Haven Engineering Department.